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ABSTRACT

Information for development has become one of the most pressing issues of the last decade, which Gulf Cooperation Council (GCC) countries have to tackle on an urgent basis. The need and urgency for planning national information systems has been clearly pointed out in several international conferences. Major research and development centers of international standard in the GCC countries are KISR in Kuwait, KACST and Research Institute at King Fahad University of Petroleum and Minerals in Saudi Arabia, and CERT in the United Arab Emirates. Five major components of the strategic approach model comprise the information plan system strategy on the national level, which should interlink closely: information resources, information services, information technology, human resources, and a national cooperative plan. In the GCC context, all components are active independently, which could deter the national development. The main functions for GCC information systems should be for documentation and information work consisting of scanning material published anywhere in any language, picking out useful materials, and listing them in an orderly manner. It is recommended that a common GCC institutional network be established, including an agency to coordinate information activities, an effective distribution and dissemination mechanism, and a consortium to avoid duplication and share knowledge. (Contains 17 references.) (YLB)

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Crossroads of the New Millennium

Transformation Of Information Technology Into Information Resources In The 21st Century In The GCC

Prepared and Presented

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Poster Presentation

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Abstract

Information and knowledge-based resources have been recognised as major ingredients for national development as we are in the 21st century. In principle, all the GCC countries acknowledge the importance of information by adding it as a new programme along with other major national programmes. Information resources and information technology leading to network is a blessing for the GCC countries, having very advanced and reliable telecommunication system. But the major problem is absence of national or regional network planning. Today, an explosion of information is occurring, and it is being fuelled by advanced communication satellites, fibreoptic cables, supercomputers, and other technology. It would appear that information for development has become one of the most pressing issues of the last decade, which GCC countries has to tackle on urgent basis. H.H. Shaikh Zayed bin Sultan Al Nahayan, rightly proclaimed that for national development training of nationals is a key element. Under the continued guidance of H.E. Shaikh Nahayan bin Mubarak Al Nahayan higher education development has enhanced to fulfill that vision for national educational development in UAE.

Even with the best available interactive videoconferencing technology in the world, backed up with full E-mail and Internet capabilities, we still require a strong element of person-to-person contact for the educational process to work. At a time when the global employment situation remains grim in most countries, the quickening pace of globalisation and technological change offers challenges and opportunities. Yet a country's ability to take advantage of those opportunities, and thereby minimise the social costs of a more open economy, depends at least partly on the level and quality of the skills it possesses with nationals. KISR in Kuwait, KACST, Research Institute at King Fahad University of Petroleum and Minerals both in Saudi Arabia and CERT in UAE are the four major R & D centres of international standard in the GCC countries. It would be more beneficial for all the major R & D institutes like KISR, KACST, GOIC, ESSR, Research Institute (KFUPM) and CERT to form a consortium to avoid duplication and share knowledge management based on information network proposed by me for national and regional development. The major challenge for all educators will be to remain open and humble enough to realise that we are no longer able to teach in the traditional sense of the word. We must break old educational paradigms, provide the resource and wisdom basics, and to act as guides for our students as we all learn together for national, regional and international development.

Transformation of Information Technology into Information Resources in the 21st Century in the GCC

In 1980's, among developing nations the fear that they were becoming increasingly dependent on industrial countries for information and technology prompted them to increase their efforts to organise their own national information systems. Furthermore, international and regional organisations, both governmental and intergovernmental, have become more concerned with the growing information gap between the more and less developed worlds, and have increased their efforts to help the latter improve to generate and handle information. It would appear that information for development has become one of the most pressing issues of the last decade, which GCC countries has to tackle on urgent basis.

Higher education in the GCC countries has undergone tremendous growth and diversification from 1980's to the turn of the century (more recently in the private sectors). The unparalleled growth of academic/national research libraries and information in the Gulf Co-operation Council (GCC) countries received an extraordinary boost in the last 20 years. Petrodollars were channelled to build indigenous information capability. GCC countries are now in the process of formulating information policies based on rapid industrialisation following the western pattern of development in the 20th century.

Information has often been described as the life-blood of progress for a country. National policy of information technology for information resources is a necessity. This must go hand in hand with a national information policy. Implementation of these policies must rest with the statutory bodies responsible for development or with the statutory body responsible for the development of information systems throughout the nation.

Technology according to Bush (1981) is a form of human activity that applies the principles of science and mechanics to the solution of problems. It includes the resources, tools, processes, personnel, and systems developed to perform tasks and create immediate particular, and personal and/or competitive advantages in given social, economic, and social context. From the literature review I delineate three meanings of technology assumed in popular and academic discourse: technology-as-instrumentality, technology-as-industrialisation, and technology-as-novelty. Unfortunately last definition is highly favoured in the GCC context. Every senior-level executive responsible for information technology within an organisation struggles with information overload.

Technological innovations and new product developments occur almost too rapidly to follow. Sifting through the massive amounts of information produced by vendors and experts in order to make informed decisions is becoming almost difficult if not impossible. Technological paradigms are changing. By the time one technology is firmly understood, another replaces it. At a time when the global employment situation remains grim in most countries, the quickening pace of globalisation and technological change offers challenges and opportunities. Yet a country's ability to take advantage of those opportunities, and thereby minimise the social costs of a more open economy, depends at least partly on the level and quality of the skills it possesses. Today, an explosion of information is occurring, and it is being fuelled by advanced communication satellites, fibreoptic cables, supercomputers, and other technology. Society has moved well beyond Teilhard's "Noosephere" to what may be called the "Technosphere". Many scientists and others would suggest that the resulting technocratic society is desirable, just, and ultimately good.

I will limit my presentation in the framework of the following two main theses.

a) Are academic/national research libraries and information centres procure pertinent information resources in all the cases to enhance the research and development activities in science and technology in the GCC countries leading to national development?
b) Is there a need for the establishment of a science and technology information network in GCC countries on a regional co-operative basis with a distinct National Information Network (NIN) with the enhanced information technology now available for national development?

Some experts focus on the importance of international co-operation and co-ordination of information services in solving the problems of scientific and technical information in developing countries; others emphasise the importance of information technology and its application to information processing. The effective participation of a country in the development of information systems and networks at a regional or international level depends on the existence of a strong internal information infrastructure.

In the GCC perspective Information policy directed by the government to co-ordinate all matters concerning the organisation and dissemination of information, than there is general agreement that no such strategy currently exist. Individuals and societies are constantly bombarded by information. So, the problem is not one of information shortage but one of

finding better ways to access filter and use the available information. This suggests the need for efficient management of the information sector, on a national scale. Governments of the various countries, industrialised or developing countries have been concerned with the co-ordination of the national information services, aiming to organise their information services on a national bases to satisfy their citizen's information needs. In this sense, Montviloff, (1990, p. 87) considers that: it is expected that the integration of an information policy into the national development policy will result in a wider acceptance of the strategic significance of information services and their managerial implications for businesses and national economies. This evolution has made access to information faster and easier, but it has also contributed with the appearance of several problems in areas such as transborder data flow, data protection, copyright of information and technology transfer. UNESCO (1985) considers that one of the reasons for the existence of national information policies has to do with the need to formulate strategies that enable the information society to reduce the inequalities that exist in the world. This aspect is valid if we accept the idea that access to information is a source of power and that those that have access to information are information rich and those that do not have access are information poor. If a country needs to promote the effective flow of information in society, the formulation of an information policy may be a starting point in the process. Conversely, the information policy may also appear as a mechanism to introduce some constraints in the information flow. The document National Information Policies (Hill 1989,p.5) considers all the issues necessary for the formulation of information policies.

As the 2000 was approaching (much to the terror of many information technologists confronting with the " Millennium Problem ", which even dignitaries like Bill Gates personally confirmed with me at the American Library Association Meeting at San Antonio in mid January 2000. H.H. Shaikh Khaled Bin Zayed Al Nahayan, supported Y2K Challenge Award, so that the GCC technology investments will allow this region in to 21st century globally as an undisputed leader in the world of Information Technology was a very wise decision. It is only natural that we were all eager to peer into the crystal ball of the new millennium, as the year 2000 presented a clear, if somewhat artificial, demarcation point of the " now " and the " future " (at least until 2001 when we begin another odyssey). It also gives a focal point on which to "look back" at where we have been and how we have arrived where we are on this millennium. At least we are not so static with the generation at the end of 1890's predicted, that there won't be any R & D, invention and discoveries in the 20th century, in contrary what a dynamic century we had.

The need and urgency for planning national information systems have been clearly pointed out in several international conferences. Planning national information systems is a continuing and complex process, which has no easy ready-made formulas, which could be completed in a short time frame. In literature almost all the studies were based either on resources or services, however in author's doctorate thesis attempt was made to study both the Information Resources and Information Services as a dual focal points to develop a regional and national information system using information technology for national development. The study led to establish base for National Information Network (NIN) and GSTIN (Gulf Scientific and Technical Information Network), which is open for discussion to implement for the national development in the GCC countries.

METHODOLOGY

GCC academic/national research libraries and information centres form part of this study. Since the application of information technology into information resources is in infancy in the GCC, there is limited number of accomplished examples available; therefore, qualitative research method was used. An up-to-date questionnaire was posted at Arab Gulf Special Library Association conference (1998-99) in Bahrain, with follow up group face to face interviews in Bahrain or by e-mail concurrently with academe's and information providers from all the six GCC countries. However, the major section of the study about Information Services is not included here, which is to be published as a part of a chapter in a forthcoming book edited by an international scholar in mid 2000.

INTERNATIONAL INITIATIVES

UNESCO in collaboration with other international organisations has sponsored many international seminars, including the UNESCO Expert Meeting on National Planning Documentation and Information resources Services. The Final Report of UNESCO's Intergovernmental Conference on the planning of National Documentation, Information resources and Archives Infrastructure, outlines sixteen objectives for transforming into action the idea whose acronym NATIS stands for national information system in action. The NATIS concept implies that the government, national, state or local, should maximise the availability of all the relevant information thorough documentation, information resources and archives services, and it takes responsibility for the basic education at primary and secondary levels of its citizens for national development.

Trigo, Correia and Wilson have done the literature review of information society for national development in the national context very diligently

In Gray's opinion "...the proportion of information - requiring and information - handling work has been growing rapidly, is now substantial and looks like growing even further" (Gray 1988, p. 2). Under this view, information is perceived as a resource that allows us to exploit other resources more efficiently. Information is seen as possessing great strategic value in the decision - making process, economic and social development and in education and training. (Trigo et. al. 1996, p.220)

Wilson (1990,p.29) considers that, due to the difficulty in defining the information concept and also to the complexity of the idea of information as an economy sector, "it is not surprising that the idea of a national information policy is also difficult".

Several reasons may be considered as providing the bases from the formulation of national information policies. In some countries, the problem consists of enabling and promoting the free exchange of information; in other situations, the information policy aims to limit the transnational exchange through the use of barriers e.g. legislation.

REGIONAL PERSPECTIVE

The quality of information produced in the GCC countries are not yet up to the standards of accuracy and reliability required for national and responsible analysis and planning decision making for national development. A reasonable number of independent research centres have not been established at regional and national levels, the research being done has not yet been institutionalised except in a few cases. It is difficult for scientists to secure funds for pure research activities. In GCC countries institutes of higher education are being established because a high priority is now attached to science and technology education, (a vivid example is UAE where number of new universities developed in the last five years: compare to one just close down) recognising that this contributes directly to the economic well-being of a country. Universities development in UAE might lead this area a centre for international learning like Cambridge-Boston in USA. Regionally King Fahad University of Petroleum & Minerals (KFUPM) and Kuwait University (KU) in the academic area and Kuwait Institute of Scientific Research (KISR) and King Abdel Aziz City for Science & Technology (KACST) and CERT are institutions/organisations of international standing which are located in GCC

countries. In certain GCC countries, the Chief Executive in the country oversees the interests of science and technology development.

In the GCC, Saudi Arabia have only organisational structures that assist in the formulation of National Science and Technology policy. In addition to KACST, Inter-University Supreme Council formulates policies for the university system in Saudi Arabia which includes all scientific research activities. The Ministry of Planning is responsible for planning and developing science and technology programmes in the country.

KISR's could be a good starting basic model, whose overall objectives are "to promote scientific and applied research and information development". Adherence to these objectives has led to the promotion of indigenous technology, the facilitation of the transfer of technology, the development of human resources in science and technology and financial and institutional support for scientific research rebuild by highly educated Kuwaitis.

CERT in UAE has established a series of joint-venture partnerships and relationships to provide a wide-range of world class technology and business solutions. Through its international contacts, CERT can offer a solution for virtually every training, education, and business need. The programmes at CERT are very unique and comprehensive for national development, which has to be pro-active and targeted. Therefore a comprehensive cost effective market plan has to be implemented, so resources and services could be provided on national/regional level to avoid any further wastage. Recently Ajman University of Science & Technology hosted an international conference on "Interactive Communication and Electronic Commerce", and under the wise leadership of Dr. Saeed Salman several innovative IT projects are underway, as well as support for regional higher education development.

At KACST the General Directorate of Information Systems support research and development by providing appropriate information to engineers, researchers, and experts in the Kingdom through on-line searches from its own databases and from selected foreign databases.

1. On-going research projects
2. Arabic bibliographies
3. Manpower
4. KACST-funded projects

KACST's responsibilities involve developing many projects and conducting many studies that are important to the country's development.

Although the initial question on information availability focused on specific standards that could be adopted for collecting information needs for development. This "top-down" approach, generally viewed, involves assessing information needs in each sector by taking into account the forms and types of information resources, the levels and categories of information users, and the purpose and functions of information in supporting specific needs.

United Arab Emirates has continued to secure number one position in GCC countries regard to the number of Internet users with record 160,000 users, followed by 85,000 in Saudi Arabia. Then come Kuwait 70,000, Bahrain 50,000, Qatar with 40,000 and Oman with 35,000. The total number of Internet among users among the GCC countries is 400,000 users. Sources in the computer companies expect a big increase in coming period in the number of Internet users, because of the wide spread of e-commerce, which will become the language of the future and the means of communication in the market during the few coming years in addition to the role the Internet is playing in the exchange of information and e-mail. With strengthening the role of the Internet is the availability of economic services such as presentation, shopping and marketing of goods and services. In addition to education, colleges' sites happenings of the market, stock exchange and corporate management. It is expected that the volume of e-commerce in the Arab world would be around 95,000-100,000 million dollars in the year 2001, with UAE playing a leadership role, with a percentage growth of 140% and the volume of international trade in the Internet is expected to reach 200 billion dollars.

NATIONAL INFORMATION RESOURCES SYSTEM BASED ON INFORMATION TECHNOLOGY

The framework for national information system comprises of five entities. The first three components, which cover the information resources, information services, and information technology, which represents the major components of the national information, model system. The fourth component of human resources and the fifth the national co-operative plans which is necessary due to the limitation of R & D production and human resources at universities and S & T research institutes in all the GCC countries.

The following major components of the strategic approach model derive the information plan system strategy on the national level, which is, suppose to interlink closely. However, in the GCC context all the components are active independently, which could deter the national development.

a. **Information Resources**

To select, procure and organise information resources in science and technology in a cost-effective manner to serve at national level.

b. **Information Services**

To promote and disseminate consistent and prompt information, exploiting information networks at local regional and international levels of all types and forms with adequate facilities.

c. **Information Technology**

To activate an automated system exploiting the contemporary information technology and co-operative information resources networking using multimedia.

d. **Human Resources**

To stimulate users to be self-sufficient and elevate the skills at national LIS to exploit national information resources and technology in the most effective and efficient manner through educational training programme.

e. **National Co-operative Plan**

To design the national information policy in science and technology at national levels for effective decision by providing a framework to evolve and execute co-operative national projects and programmes.

Information resources and information technology leading to network is a blessing for the GCC countries, having very advanced and reliable telecommunication system. But the major problem is national or regional network planning. This problem has to be rectified before a national or a regional network can work. Another major drawback in GCC context is the total in-consistency in human resources and national development. There is an urgent need for strategic planning sector by sector with deadlines to be implemented.

Gutenberg's invention of the printing press represented the first freeing of the general population from the tyranny of education of elite's. The Internet has furthered this freeing by bringing information into the hands of everyone who has access – although not yet equal access – to a reasonable public education system.

i. Language difficulties
ii. Difficulties of a psychological or intellectual nature - the presentation of information
iii. The "pollution" of information--not in perfect condition
iv. Legal and administrative barriers hindering the flow of information across national borders.

Currently in most of the GCC countries, the information resources look very much different from the past two years. Campus wide networking of Open Public Access Catalog (OPAC) and CD-ROM searching, full-text databases, prompt and low-cost electronic document delivery services have proved an invaluable vehicle to extend campus wide information resources services successfully, and to convince the information patrons that the information technology (IT) resources offers "total solution" to their information resources demands. The first initiative in this area was taken by KFUPM.

Advances in computer and information technology facilitate the speed and force of the trend toward decentralisation, and that trend, in turn, has a dramatic impact on the way those technologies are being used in the field of information resources, automation and networks. Information technology is seen as a panacea for many information resources ills but there are considerable of information resources altogether, accustomed to electronic information and retrieval additional or alternative sources of information, thus Information Technology solves many services problems, in academic and science and technological information resources.

As a result of the growing use of computers and continuing improvements in information communication technologies, there has been an accelerating growth of information resources and information services. In the past two years, for example, networking was absent from the branch libraries, OPAC terminals were few in quantities to serve campus-wide users, CD-ROM databases development was in the beginning stage as stand-alone system, and document delivery service was using a normal mail via the British Library & Document Service (BLDS) department. Thus the university information department was providing its IT

services locally and users used to come to the central information department searching for required materials. Today the development of the desk top work stations, coupled with an effective campus wide networking is increasingly offering academic staff and students the opportunity to exploit Information Technology (IT) from anywhere in the campus. Consequently, the central information resources have put its services in the position to meet this changing requirement.

DOBIS/LIBIS, VTLS and Horizon plus CDS/ISIS systems are mostly used to automate major information resources functions in the GCC countries including Arabised versions. Recently, new network enable users to access information resources materials from anywhere on-campus by terminal or by PC from home with Modem via telephone line. The development of network between three universities (KAU, KSU, and KFUPM) to access the OPAC system is a good initiative. A good news from KAU information resources is that it has added Arabic periodicals to the system and first time Arabic periodical holdings are available online under OPAC system at any university. It would be good for HCT, Zayed and other UAE universities to join hands to form network consortium to share national information resources for which they have to have similar automated system, which is unfortunately is not the case at the present time. With catalogues on Internet the problem has been solved instantly which the GCC countries were trying to tackle for the last twenty years. An on-line computer communication network system (GULFNET) for the GCC states is already operational, with big question mark for its operation.

KACST and KISR took the lead in developing information knowledge management manpower, for e.g. KACST initiated, which could be followed by CERT.

1. Developing manpower by employing students and training them in conducting workshops in USA as well as inviting many scholars in information science to visit the country and give lectures or contribute to workshops.
2. Encouraging librarians and information specialists in the country to achieve complete policy for co-operation between libraries and information centres in information sharing.
3. Establishing a national computer network, which links many libraries and information centres at national level.

Arrangements will have to be made for training staff already employed by the information resources in working with the new utilisation. (Computer courses are after all very popular in the GCC so the information technology aspects of information resources work might attract more able candidates to the profession). It is sad to observe that even after 12 years

establishment of HCT Learning Resource Centres, even LRC technicians are recruited from the west, who are just high school graduates with technician's diploma. The assumption is that highly paid LRC management from the west not able to train local personnel in ten years locally or national level in UAE. In contrast with manpower development programme in Oman the presenter of this session was able to co-ordinate training programme from year one and many LRC specialist were trained within three years to take over LRC information resources/services departments. Unfortunately UAE is the only GCC country without an academic programme for LRC/Library personnel and again highly paid consultant at UAE University took no initiative. The author has developed LRC programme open for discussion and deliberation with the management of higher institutes in UAE, which is both traditional classroom delivery and web based fully IT/multimedia based needed for the 21st century. But we have found that even with the best available interactive videoconferencing technology in the world, backed up with full E-mail and Internet capabilities, we still require a strong element of person-to-person contact for the educational process to work.

Technological advancements are changing the role of teacher to that of educator. Management sage Peter Drucker has confidently predicted the demise of the university within 30 years. Drucker is dead wrong, for a number of reasons, including 1. Educators will be able to use technology to develop exiting, high-impact learning experiences, but they will not be replaced by it. 2. The proliferation of information now available has created a need for excellent educators. If caring about students is prerequisite to motivating them to learn then technology alone cannot do the job. Without a doubt, technology will replace teaching that merely conveys facts. The real value of education is not in what one learns, but in how one develops. This development requires social interaction. Technology has enabled us to reach out to more people who could never have taken a programme such as ours – people who may be unable to take the time to return to school or, indeed must somehow integrate their education with their workplaces, Using affordable, studio-quality videoconferencing has allowed us to offer our highly interactive, casebased programmes in both "high-tech" Videoconferencing (mini-studio) and "low-tech" (classroom) modalities.

The most prominent national science and technological institutes / organisations in the GCC are KACST in Saudi Arabia, KISR in Kuwait and CERT in UAE, basically based on the model developed by the Research Institute of the King Fahad University of Petroleum and Minerals (originally University of Petroleum and Minerals (KFUPM), where the speaker was instrumental in developing both national and international information projects.

Information resources and information technology leading to network is a blessing for the GCC countries, having very advanced and reliable telecommunication system. But the major problem is national or regional network planning. A well-organised national CD-ROM network plan could be developed leading to a regional plan, because the subscriptions for the CD-ROM are still very expensive or with recent Internet connections the door of CD-ROM usage is open by them.

KISR in Kuwait is pursuing integration of networked information resources into information services, a measured process of systematic research and strategic planning is progressing since 1991 pursuing an aggressive programme of automation to introduce electronic information provision into NSTIC operation and services which enhanced information services and staff expertise inspite of both financial and staffing constraints, where I was active as Strategy Team Member.

The National Information System should be responsible for:

1. Provision of national information services to meet the present needs of users, generators, processors and disseminators of information.
2. Optimum utilisation of existing information services and systems and the development of new ones.
3. Promotion of national and international co-operation and liaison for exchange of information.
4. Support and provide active encouragement for the development of facilities for education and training in information science and technology.
5. Support and promote research and development and innovation in information technology.

In the joint interview and follow up e-mail correspondence was based on the following two queries:

The first is the question of whether there was a need for a national / regional information policy and the second is related to information availability, accessibility, and utilisation.

Initial reflections often focused on whether a national information policy was necessary for the GCC countries. Some individuals suggested that country like Saudi Arabia be in a unique position that may not be shared by other countries. Taking all this into consideration, and

assuming that information is as indispensable a component of development as any other, several participants asked whether information services is parallel what the GCC countries has achieved. Many felt that despite recent development in the field, information services in the GCC has not experienced the same rate of development as other sectors. It is difficult to think of a form of information service not being offered in the country. Returning to the initial question, almost all those interview felt the urgent need to formulate a national and or regional information policy for the GCC. Further the policy should reflect the increased need for effective collection, organisation, and use of information.

Although the initial question on information availability focused on specific standards that could be adopted for collecting information needs for development. This "top-down" approach, as one individual viewed it, involves assessing information needs in each sector by taking into account the forms and types of information resources, the levels and categories of information users, and the purpose and functions of information in supporting specific needs.

Another issue raised during the interviews related to the structure of information distribution and dissemination services. As one respondent indicated, most large information systems in Saudi Arabia are located in one region (Central region) and due to the lack of effective distribution and dissemination mechanism in the country, there seems to be a geographical distance between the products and services of systems and potential users. This problem in fact raised two issues. One dealt with the concept of information marketing, which is almost completely ignored in the GCC countries. The other issue related to new possibilities for exploiting recent developments in information technology as an effective means of information processing and dissemination.

Aside from basic information technology, such as the production of simple indexes and union lists and printing of bibliographies and catalogues, many individuals stressed the need to build local databases appropriate to indigenous needs. The databases, whether developed by government and /or the private sector, would serve specific purposes, such as bibliographic and information retrieval, inter-library loan and resource sharing, and the like. While some individuals believed that only Saudi Arabia now maintains a growing technical and human base for developing indigenous information technology, others doubted that the country has such a base and in other countries the situation is quite variable, unfortunately due to lack of planning.

Most respondents agreed that the tradition of using information resources is not well developed in the GCC, and that the skills and knowledge of those using information to solve specific problems are low. This causes under-utilisation of information systems and services available in the country. A third major concern dealt with the promotion and marketing of information services and products. It was quite evident to many interviewees that lack of methods of information marketing, including market research, limits information utilisation. Some individuals suggested that GCC information resources and information professionals should have well established public relations programmes, which would contribute to increased information use.

Regardless of the GCC economic situation, all interviewees felt that certain policies related to the cost of information should be established. Some interviewees argued that introducing charges to users might lead to a social division of information rich and information poor. Some information resources administrators argued that charging fees to individual users might result in resistance on the part of the users. Other issues associated with the cost of information included (1) whether fees contribute to the quality of information obtained, (2) whether they should be applicable to all categories of users, and (3) whether they should cover all types of information services or only specific services, such as on-line searching. Another issue raised by some information resources administrators related to whether fees obtained for services should be given to institutions providing these services. For information not available from the information resources, turned to personal contacts, the originator and contractors. Almost three-quarters of the respondents said they could not get the information they needed from the information resources - particularly engineers in universities and research institutes. But one has to understand the kind of information required by staff before judging the information resources.

Most issues regarding information utilisation related to users. It was quite evident to many individuals that information users constitute the weakest area as far as information use is concerned for with closed-door policy and self-centred information providers are responsible unfortunately ignoring community needs. Most respondents agreed that the tradition of using information resources is not well developed in the GCC, and that the skills and knowledge of those using information to solve specific problems are low. This causes under-utilisation of information systems and services available in the country. A third major concern dealt with the promotion and marketing of information services and products which does not exist in the GCC. It was quite evident to many interviewees that lack of methods of information

marketing, including market research, limits information utilisation. Some individuals suggested that GCC information resources and information professionals should have well established public relations programmes, which would contribute to increased information use. Regardless of the GCC economic situation, all interviewees felt that certain policies related to the cost of information should be established. Some interviewees argued that introducing charges to users might lead to a social division of information rich and information poor.

CONCLUSIONS AND RECOMMENDATIONS

In the absence of a national information network the users needs cannot be fulfilled satisfactorily, however, the low usage in always a deterrent against the information systems development. The establishment of a scientific and technological information system is based on the presumption that there must be a number of scientists, engineers, technologists, etc., to use the services.

It is recommended that the main functions of GCC information systems should be for the documentation and information work consisting of scanning the material published anywhere and in any language picking out the useful material and listing them in an orderly manner for the benefit of scholars and users. The information work consists of evaluation, analysis of documents and provision of state of the art reports and automation, etc. To compile indices on subjects related to research and development in science and technology providing the nature of information contained in various documents.

In order to provide effective and efficient information provision it is suggested that the most efficient means of acquiring processing and disseminating information should include on national and regional level:

1. Identification and study of the information needs of users;
2. Establishment of a national science information resources that can cover comprehensive materials available only at the national, regional and international level;
3. Identification of international information centres, associations, societies, publishers marketing investigation industries and other sources in order to access comprehensive technical information; marketing investigation industries and other sources in order to access comprehensive technical information;
4. Provisions to users of access points by using new information technology;
5. Provision of an efficient information storage and retrieval system;

6. Computerisation of information systems for the distribution of information;
7. Creation for distributors of various information channels such as NTIS, JICST and BLDSC through the use of new information technology;
8. Provision of information from foreign databases with translated abstracts in Arabic, and translation of GCC databases into English to make possible an international information exchange;
9. Qualitative improvement in the efficiency of databases produced by several GCC information centres;
10. Delegation of responsibility to a central information agency for developing databases produced in GCC and creating a GCC thesaurus in several fields, instead of delegating these roles to various information entities;
11. Training of information professionals with a strong subject background in the areas of science and technology, to be involved in managing information flow, specifically in developing a GCC thesaurus in specialised areas, standardising vocabulary, indexing and abstracting;
12. Planning by the policy makers at a national level of an information network, electronic information resources so that information can be accessible on computers;
13. Interfacing the scientific and technical information network with a national computerised education and research network, one of national networks;
14. 14 A major role for the government in developing and updating information retrieval languages in the areas of specialised science and technology;
15. Co-ordination of acquisition and cataloguing among specialised information centres under the co-ordination of national information agency;
16. Improving the GSTIN information handling activities through;
17. GSTIN location under GCC for the control and co-ordination of scientific and technical information activities;
18. Development by GSTIN of a variety of information sources and provision of services efficiently.

GCC countries through co-operation, would become more effective and competitive in scientific and technological achievement. Institutional structures for science and technology for the entire GCC would then become feasible so as to co-ordinate the efforts of the regional institutions towards a common and sustained GCC action.

The GCC countries should consider establishing within the family of the GCC: a GSTIN (Gulf Science and Technology Information Network) which could be the nucleus of a common GCC institutional network.

Currently, the actual collection of information resources in the GCC is done by various information agencies which, according to one senior official, is not harmonised so as to form the information elements needed for national development. This problem may be closely associated with the lack of a planned and organised effort to co-ordinate the functions of various information agencies. One possible way to ensure such co-ordination is to designate an appropriate agency for co-ordinating information activities, including information collection for various agencies functioning in many priority sectors. Several issues concerning information accessibility were raised during the interview. One aspect of information accessibility related to the services required organising information. While many individuals considered the private sector to have a positive contribution to develop added-value information services and products, others believed that the quantity of information generated within most of the GCC countries was not sufficient to warrant such involvement. Some others also believe that since government regulates and controls information flow, private sector involvement in information field may be blocked. However several companies from private sectors like Dabbagh Technology, Arabian Advanced System and EDUTECH etc are doing a wonderful job as information broker for information provision in the GCC countries. Despite this situation, some information resources administrators emphasised the private sector's role in acting as an information broker in the country, while government information agencies can continue carrying out other added-value information services and products (e.g., indexing and abstracting services).

The structure of information distribution and dissemination services is inadequate due to the lack of effective distribution and dissemination mechanism in most of the GCC country. There seems to be a geographical distance between the products and services of systems and potential users even in smaller countries like Bahrain and Qatar. This problem in fact raised two issues. One dealt with the concept of information marketing, which is almost completely ignored in the GCC countries. The other issue related to new possibilities for exploiting recent developments in information technology as an effective means of information processing and dissemination.

The perceptions of science information resources users are essential to this process of "rethinking" and change. It is important to know who the users are, what their information needs are, and how they feel about the information resource's services and its collection, including both printed and electronic information resources.

At national level all the GCC countries should:

i. Formulate and implement science and technology policies, taking into account national social and economic goals.
ii. Develop national research capabilities technology research parks, facilities, and the necessary infrastructure.
iii. Undertake and support specific research programmes in areas important to national social and economic development objectives.
iv. Organise and support joint international/national research programmes.
v. Create and manage a system of national research laboratories to focus on applied research of unique interest and need.
vi. Establish and maintain a scientific and technical manpower information system as an aid to science planning and effective use of scientific and technical personnel.
vii. Organise, operate or sponsor effective science information institutions and activities, including international conferences, symposia, and research publications that will be useful in achieving the objectives, e.g. one being held today by HCT in Abu Dhabi.
viii. Co-operate with universities, laboratories, and other research centres to encourage research exchange knowledge and experience, and avoid duplications of effort.

Disconnected from the social and historical roots of technological progress, technology transfer is embraced on a global level as a tangible solution to the third-world development problem. Left under-scrutinised is the dehumanising potential of using technological progress as a gauge for civilisation advancement. In the GCC context increasing globalisation of the link between progress and technology is demonstrated, which has accelerated its modernisation efforts in the last 10 years. On one hand, alternative models are required for envisioning social and environmental sustainability; on the other hand, strategies for intervention are needed to overcome deep-seated ideological beliefs about progress. Education represents a key site for producing and shaping ideological beliefs

Based on any analysis of training systems and strategies world-wide, countries in different circumstances and at different stages of development can use training to increase their

national competitiveness, improve the efficiency of their enterprises and promote employment growth all necessary for national development.

It would be more beneficial for all the major R & D institutes like KISR, KACST, GOIC, Research Institute (KFUPM) and CERT to form a consortium to avoid duplication and share knowledge management for national and regional development.

The next challenge will involve the evolution of new individual and organisational social behaviour and norms that will enable us to live and work within all of the new and dynamically changing connections. Social forms that will allow for truly interdependent activities in areas such as global shopping, entertainment, education, and telecommuting have yet to emerge. Our students, who will spend most of their working lives in the 21st century, will come to perceive the computer and its related information technologies as extensions of themselves-simple tools much like paper and pencil, the abacus, the slide rule, and the calculator. The promise is that IT will enable us to enhance our ability to synthesise ideas, to gain greater insights into complex applications of basic productivity tools. The major challenge for all educators will be to remain open and humble enough to realise that we are no longer able to teach in the traditional sense of the word. We must break old educational paradigms, provide the resource and wisdom basics, and to act as guides for our students as we all learn together for national, regional and international development.

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